

High-Energy Micro-Focusing by Meridionally-Bent Laue Crystals

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It is well-known that meridional focusing can be achieved by bent Laue crystals when the source and image points are outside and inside the Rowland circle, respectively. Third-generation high-energy synchrotron facilities provide intense high-energy x-ray beams and a small vertical electron beam source size. In combination with large demagnification ratios (source distance divided by image distance), high-energy micro-focusing is therefore achievable. The Laue geometry is attractive as the crystal surfaces are almost perpendicular to the x-ray beam, resulting in a short footprint on the crystal, minimizing aberration effects. At the same time, crystal bending enlarges the bandwidth, resulting in a welcome flux increase. Unfortunately, it also results in a "thickness-broadening" of the ideal focus size. It is shown that this thickness-broadening can be avoided by an appropriate asymmetric cut of the bent Laue crystal. Practical implications of this optic's use in diffraction studies of polycrystalline samples are discussed.

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